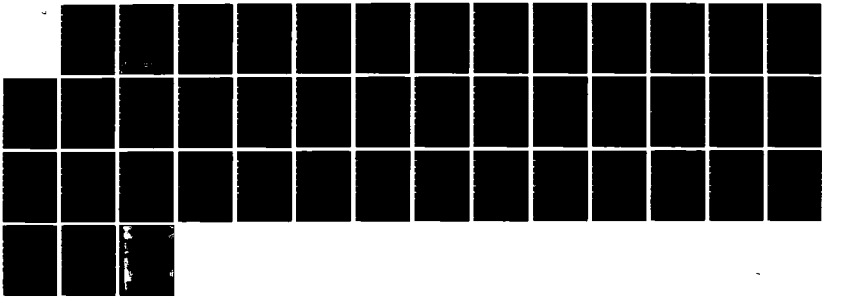
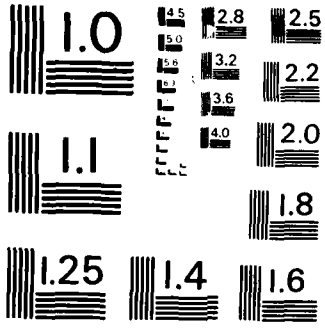
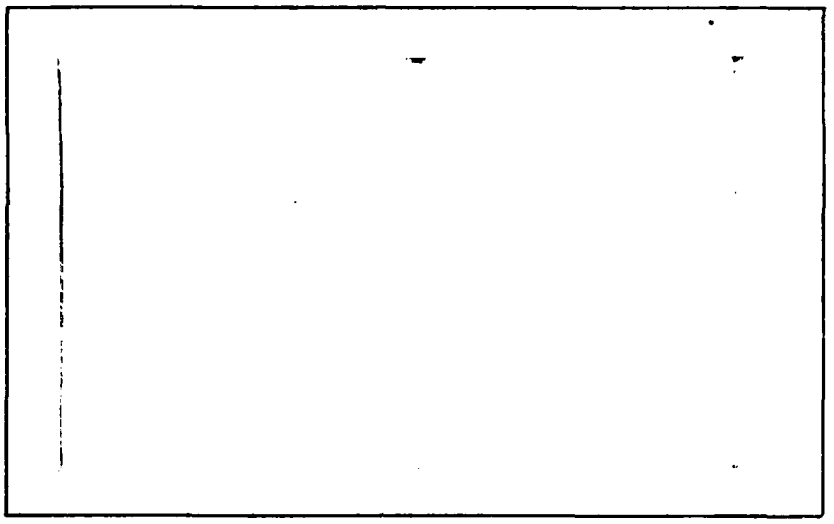
AD-A142 371 AN EVALUATION OF THE WSSC (WEAPON SYSTEM SUPPORT COST) 1/1
COST ALLOCATION AL.. (U) DESMATIC INC STATE COLLEGE PA
G J ZUNIC ET AL. JUN 83 TR-115-9 F33600-80-C-0554

UNCLASSIFIED F/G 15/5 NL





MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS - 1963 - A



— STATISTICS —

— OPERATIONS RESEARCH —

— MATHEMATICS —

DESMATICS, INC.

P.O. Box 618
State College, PA 16801

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER 115-9	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) AN EVALUATION OF THE WSSC COST ALLOCATION ALGORITHMS VI: PERSONNEL RELATED CATEGORIES		5. TYPE OF REPORT & PERIOD COVERED Technical Report 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Gregory J. Zunic Arlene R. Munson Patricia H. Weber Dennis E. Smith Robert L. Gardner		8. CONTRACT OR GRANT NUMBER(s) F33600-80-C-0554
9. PERFORMING ORGANIZATION NAME AND ADDRESS Desmatics, Inc. P.O. Box 618 State College, PA 16804		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS HQ AFLC/MML(VAMOSC) Wright-Patterson AFB, OH 45433		12. REPORT DATE June 1983 13. NUMBER OF PAGES 36
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)		15. SECURITY CLASS. (of this report) Unclassified 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Distribution of this report is unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

VAMOSC
Cost Allocation
O&S Costs

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report by Desmatics, Inc. is the sixth in a series of volumes which review procedures used by the Weapon System Support Cost (WSSC) subsystem of the Air Force Visibility and Management of Operating and Support Costs (VAMOSC) system to allocate operating and support costs to Air Force weapon systems. It presents: (1) the results of an examination of algorithms and data used by WSSC to allocate medical and permanent change of station costs, (2) an evalu-

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

DESMATICS, INC.

P. O. Box 618
State College, PA. 16801
Phone: (814) 238-9621

Applied Research in Statistics - Mathematics - Operations Research

AN EVALUATION OF THE WSSC COST ALLOCATION ALGORITHMS

VI: PERSONNEL RELATED CATEGORIES

by

Gregory J. Zunic
Patricia H. Weber
Robert L. Gardner
Arlene R. Munson
Dennis E. Smith

TECHNICAL REPORT NO. 115-9

Original Draft April 1983

Final Draft June 1983

Prepared under Contract No. F33600-80-C-0554

EXECUTIVE SUMMARY

This report by Desmatics, Inc. is the sixth in a series of volumes which review procedures used by the Weapon System Support Cost (WSSC) subsystem of VAMOSC to allocate operating and support costs to Air Force weapon systems. It presents: (1) the results of an examination of algorithms and data used by WSSC to allocate medical and permanent change of station costs, (2) an evaluation of a proposed algorithm for personnel acquisition and initial skills training costs, and (3) suggestions to aid the Office of VAMOSC in development of algorithms for advanced training and advanced flying training costs.

Desmatics judges the FY82 medical care cost allocation algorithm to be fundamentally sound. However, Desmatics does recommend expanding the scope of reported medical costs to include the addition of (1) dental care costs, (2) medical care costs incurred by the dependents of active duty personnel, and (3) costs of certain special programs. Desmatics suggests that the Office of Air Force Surgeon General be tasked to assist in this development of a more complete medical factor.

The Permanent Change of Station (PCS) cost algorithm implemented for FY82 is a reasonable technique for portraying military PCS costs. However, in Desmatics' opinion WSSC could more closely conform to CAIG guidelines in this area by combining civilian PCS costs with military PCS costs. (For FY81 and FY82, civilian PCS costs are included in WSSC without separate visibility.) Also, Desmatics recommends that the Office of VAMOSC determine more precisely the process by which PCS cost records are reported in H069R. PCS costs may be imbedded in accounts which WSSC accepts for other purposes, in which case they would duplicate the costs computed by

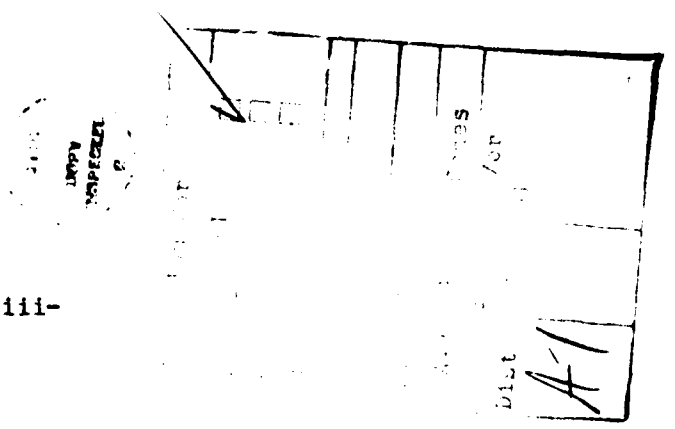
the WSSC PCS algorithm.

The validity of the proposed acquisition and training algorithm depends on the ability to match the PEC of the personnel records to an MDS. Desmatics has determined that a large portion of the records can be successfully matched. Those that remain unmatched can be allocated using techniques suggested by Desmatics.

Since no algorithms exist to capture the costs of advanced training and advanced flying training, Desmatics has identified potentially useful data and has suggested methods of applying this data in an allocation algorithm. Desmatics recommends that the Office of VAMOSC use the AF Form 611 portion of the Formal Training Cost Report and AFM 50-5 as data sources in the development of the required algorithms. A change in the presentation of these costs on WSSC cost reports is also recommended to clarify the relationship of these training costs within the total O&S cost picture. Desmatics suggests that they be reported separately and not added to the total O&S cost of an MDS, since training costs inherently overlap many of the other O&S cost categories. To remove the training portion of the other O&S costs would result in a misleading representation of an MDS's O&S costs, and is not recommended.

In summary, Desmatics makes several specific recommendations for changes in WSSC processing, and raises several points for consideration by the Office of VAMOSC regarding possible further changes and development of new algorithms. Action on these recommendations should improve the WSSC processes, thus increasing the utility of WSSC reports, and bringing WSSC procedures more in compliance with CAIG guidelines.

TABLE OF CONTENTS



I. INTRODUCTION

Desmatics, Inc., under Contract No. F33600-80-C-0554, is conducting an evaluation of the cost allocation algorithms employed in the Weapon System Support Cost (WSSC) Subsystem of VAMOSC, the Air Force Visibility and Management of Operating and Support Costs System. This report is the sixth in a set of volumes which discuss the scope and findings of the Desmatics evaluation efforts.

The purpose of this volume is to evaluate the WSSC procedures for allocating the following indirect personnel support costs to Air Force aircraft weapon systems: medical care, permanent change of station (PCS), personnel acquisition and training, advanced training and advanced flying training. This report is restricted to a qualitative examination which evaluates the face validity of the WSSC system logic. It evaluates the reasonableness of the procedures used for selecting, classifying and allocating the above-mentioned costs to weapon systems, assessing whether they may be expected to provide equitable results. A quantitative evaluation to determine mathematical validity will follow in Volume VII when the required data has been collected and analyzed.

Based on its research, Desmatics has made a number of specific recommendations which are enumerated in Section VII of this report. The corresponding responses and comments of the Office of VAMOSC accompany each recommendation.

The Statement of Work under which this Desmatics study was initiated calls for the evaluation of the WSSC system algorithms as set forth in system specifications dated June 1980. The WSSC system has evolved almost continually since that time, reflecting improvements that were made in virtually

every aspect of the system logic prior to the first production runs in April 1982. Additional modifications and enhancements were made to WSSC between the first production run in 1982 and the second run made in April 1983, and more are planned for the immediate future.

Desmatics recognizes that to restrict its evaluation to the June 1980 baseline would significantly limit the usefulness of its findings. Accordingly, Desmatics has kept pace with the evolution of the WSSC system, and has attempted to reflect the significant system changes in its study, specifically in those instances where a given cost was computed by different algorithms in two (or more) years. As a result, the documentation of Desmatics' findings is more complex than might otherwise be the case. The reader may expect frequent encounters with the phrases "for FY81," "for FY82" and "for FY83."

Desmatics has endeavored to have this volume reflect the current status of indirect personnel support cost allocation algorithms within the WSSC system. The authors feel that this has been accomplished. However, the reader must realize that should future WSSC system changes impact on the algorithms discussed, portions of this report may become outdated.

II. BACKGROUND

The cost allocation procedures evaluated in this volume involve indirect personnel support costs for medical care, permanent change of station, and personnel acquisition and training. The Office of VAMOSC has not yet developed formal procedures for collecting and allocating costs for the two other categories of personnel related costs, advanced training and advanced flying training, which are to be separately portrayed in the USAF Detail report. Of the cost categories listed, only those for medical care were available for FY81 reporting. The allocation procedure for these costs was changed for FY82. PCS costs were the only additional ones available for FY82.

Because the WSSC and VAMOH systems are unable to obtain the above categories of costs by MDS directly from available data, the costs must be allocated on some reasonable basis. The processes used to allocate medical costs for FY81 are described in three WSSC source documents: (1) WSSC User's Manual, AFR 400-31, Volume II, (2) the WSSC System/Subsystem Specification [10], and (3) the VAMOH Subsystem Specification [9]. The algorithms for the allocation of medical care costs for FY82 and the remaining categories were obtained from copies of briefing slides from the August 1982 WSSC Training Conference [8] and from relevant Data Automation Requirements.

In this report, each existing algorithm is discussed in a separate section, which includes a process description and a qualitative evaluation of the algorithm. In order to provide assistance to the Office of VAMOSC in its future development of algorithms for advanced training and advanced flying training, Desmatics has devoted its technical effort on these cost categories to suggesting means for capturing the costs and identifying appropriate data

sources. The results of this effort, which are discussed in Section VI, should provide a point of departure for the Office of VAMOSC in developing formal algorithms.

III. MEDICAL CARE COSTS

As defined in the WSSC User's Manual, AFR 400-31, Volume II [17], the WSSC process for medical care costs provides "the allocated average cost of providing health care to active duty Air Force members." Specifically, WSSC allocates medical care costs to mission and support personnel associated with each MDS within the relevant commands. The costs are based on computations by the AF Surgeon General's Office (HQ USAF/SGMC).

A. PROCESS DESCRIPTION

The first step in the FY81 WSSC algorithm for allocation of medical care costs involves determining the average numbers of operations, maintenance, and installation support strengths for each command/base, and, in the case of installation support strengths, allocating a portion of these personnel to the aircraft mission. The sum of the assigned operations and maintenance strengths and allocated installation support strengths for a command/base is multiplied by a medical cost factor to give the total costs for medical care for that command/base. (The medical cost factor is computed and supplied annually by AF/SGMC.) The medical care costs for each command/base are then allocated to individual weapon systems using a flying operations ratio based on flying hour and possessed hour data.

The WSSC FY82 allocation algorithm differs significantly from that for FY81. A major change is that the medical costs at each command/base are allocated to an MDS on the basis of personnel associated with that MDS, rather than on the basis of flying operations ratios. This is accomplished by obtaining the mission and support strength associated with each MDS at the

command/base, and then multiplying this number by the medical cost factor. Another change in the algorithm was the addition of aircraft systems security personnel to the operation strengths for those aircraft requiring such security. These personnel were not included in the FY81 version of this algorithm.

The personnel selection and allocation procedures and the flying operations ratio are used in other WSSC algorithms incorporating this data. They have been described in detail and evaluated in previous volumes of this series [2,3,4].

B. QUALITATIVE EVALUATION

In Desmatics' opinion the WSSC FY82 procedure which first allocates personnel strengths to an MDS, and then applies the medical cost factor to these totals is superior to the FY81 procedure which used a ratio based on flying hour and possessed hour data. Medical care costs are incurred directly by associated personnel rather than by the weapon system, per se. Therefore, unit mission and support personnel strengths are the major cost drivers for this category.

Desmatics concurs with the inclusion of security personnel, where required, in the assignment of medical costs to MDS's in the FY82 algorithm. Costs associated with these personnel constitute an integral part of the total support for those aircraft requiring security.

In general, Desmatics views the WSSC FY82 medical care cost allocation algorithm in its conceptual form as adequate to report the desired costs. However, Desmatics feels that certain improvements should be made in its implementation. Before these improvements can be addressed, however, a

brief discussion of the medical cost factor is required.

As previously mentioned, the medical cost factor is provided by AF/SGMC. That office was a primary source of the information discussed in the following two paragraphs.

In mathematical notation, the medical cost factor may be expressed as

$$\text{Medical Cost Factor} = \frac{[(AxC) + (BxD) + F]}{E}$$

where:

A = average cost per occupied bed day (OBD)
B = average cost per outpatient visit (OPV)
C = total AF extended active duty (EAD) OBD's
D = total AF EAD OPV's
E = total AF EAD strength
F = cost of centrally funded care.

Two types of data are required for computation of this cost factor. The first is cost data; the second is count data (of OBD's, OPV's, and strength). The latter data is obtained from the Biometrics Division, Air Force Medical Service Center, Brooks AFB. This count data is based on actual statistics, rather than on estimates. The medical cost information is developed from data accumulated by the Surgeon General in the Uniform Chart of Accounts for Fixed Military Medical and Dental Treatment Facilities.

At the highest level of the hieracrchy within the Uniform Chart of Accounts are six functional categories: (1) Inpatient Care, (2) Ambulatory Care, (3) Dental Care, (4) Ancillary Services, (5) Support Services, and (6) Special Programs. In its computation of the factor provided to the Office of VAMOSC, AF/SGMC included only cost categories (1), (2), (4), and (5).

It is Desmatics' opinion that cost category (3), Dental Care, and portions of cost category (6), Special Programs, should be included in calculation of the medical cost factor. Dental care is, of course, an important and integral part of total health care. (When informed by Desmatics that

dental costs were not included in the medical cost factor, the Office of VAMOSC stated that it had intended for those costs to be included in the factor. Evidently, they were not included because the Surgeon General's Office interpreted "medical care" as a subset of a broader category of "health care," with "dental care" another subset.)

Desmatics has examined the list of summary accounts and subaccounts contained within the category of Special Programs [6]. It appears that expenses from many of these accounts should be included by WSSC in the determination of allocated medical care costs. For example, there is an account for "Supplemental Care Purchased from Civilian Sources" within the subcategory of "Health Care Services Support" and several subaccounts within "Patient Movement and Military Patient Administration" which appear to involve legitimate medical care costs. Desmatics recommends that the Office of VAMOSC confer with the Office of the Surgeon General to determine which specific Special Program accounts should be included in WSSC processing.

Desmatics also suggests the inclusion of those medical care costs attributable to dependents of active duty personnel. These expenses are directly related to unit mission and support personnel strengths associated with an MDS and are therefore legitimately allocable to the weapon system.

Although the inclusion of the above-mentioned costs is recommended by Desmatics, there are a number of problems to be overcome before they can be included. These problems are briefly discussed in the following paragraphs.

The dental expenses omitted from consideration in the development of the medical cost factor include costs for all normal dental services and prosthetic laboratory support. These expenses are accounted for in the Uniform Chart of Accounts on the basis of level of service provided, rather

than by patient category and actual patient visits as is done for other types of medical treatment.

In addition, some costs for civilians and retirees are accumulated in these expenses. Other dental costs excluded are those for Type 1 Area Dental Prosthetic Laboratories which are in a Special Programs subaccount. To include these costs in a revised factor requires the estimation of the share incurred by active duty personnel and dependents (if it is decided to include costs for the latter).

Centrally funded care for dependents is provided through the Civilian Health and Medical Plan for Uniformed Services. (CHAMPUS). Other CHAMPUS beneficiaries include retirees and their dependents, as well as dependents of deceased uniformed service personnel. Since the benefits are apparently not directly identifiable to type of beneficiary, those received by dependents of active duty personnel would have to be estimated. In addition, in deciding which of the Special Programs accounts should be included for allocation purposes, the Office of VAMOSC needs to determine whether or not these expenses are entirely attributable to active duty personnel.

An in-depth investigation by the Office of VAMOSC would be required to determine how these problems could be solved. However, Desmatics feels that such an investigation would be worthwhile.

Moving briefly to another topic, a question exists as to whether a worldwide or a base-level medical cost factor should be used to allocate medical costs to weapon systems. According to information from HQ USAF/SGMC the data necessary for developing base-level medical cost factors is available. Since WSSC tries to present costs at the lowest level available, one might conclude that a base medical cost factor would more accurately reflect medical costs to the end items at that base. There are several problems

with this view:

1. If a base has a small medical facility, personnel from that base may go to another base to get treatment.

2. A base medical facility which is used extensively by retired people and dependents may have its medical cost factor influenced by these people, rather than by the weapon systems at that base.

3. Dependents of active duty personnel (if they are included in the medical cost factor) are not always colocated with their sponsors.

Desmatics therefore concludes that while base medical cost factors could be developed, this would not necessarily provide a more equitable distribution of medical costs to weapon systems.

A final subject of discussion deals with the CAIG guidelines [1] for reporting medical costs. These guidelines recommend the following portrayal of expenses related to medical care: (1) the presentation of both the cost and numbers of medical personnel needed to support a unit at its peacetime location and (2) the inclusion of medical supply support costs (without separate visibility) within miscellaneous operations and maintenance costs. Although the WSSC approach to collecting and portraying medical care costs differs somewhat from the CAIG guidelines for these expenses, the WSSC presentation of an allocated portion of the total medical costs generates a realistic view of the full cost of health care provided to mission-related personnel.

IV. PERMANENT CHANGE OF STATION

Permanent Change of Station (PCS) costs are incurred in the movement of military and civilian personnel resulting from a change of permanent duty station. These costs include such items as moving allowances, travel expenses, and per diem. Table 1 contains a listing of PCS move categories and type-PCS codes.

A. PROCESS DESCRIPTION

WSSC had no algorithm to compute and separately display PCS costs in FY81. Instead, these costs were included in the various pay and allowance categories in two ways. First, the pay tables used to compute aircrew pay included a per-person average PCS cost as part of the composite pay rate, thereby implicitly computing PCS costs along with pay. Second, the pay and allowances extracted from the H069R accounting system for all other personnel also included some costs for PCS.

Because there was no separate visibility of PCS costs for FY81, the PCS cost detail line in both the CAIG and USAF Detail report forms was assigned a value of zero dollars. The Office of VAMOSC began providing separate visibility of PCS costs with FY82 WSSC reporting. PCS arrival data is obtained from the E300Z interface to WSSC. These personnel arrival records include command, base, functional account code (FAC), program element code (PEC), grade-type (officer or enlisted), type-PCS code, and date-arrived-on station.

If the date-arrived-on-station on the record is during the past fiscal year, then the type-PCS code is matched against a table of average PCS cost

CATEGORY OF PCS MOVE	TYPE-PCS CODE
Accession - moves to first permanent duty station	A
Training - moves to, from, and between schools of at least 20 weeks duration	B,C,D
Operational - HQ USAF directed moves within CONUS or nontransocean travel overseas moves	E,F,G,H
Rotational - to and from overseas and between overseas involving transocean travel	J,K
Separation - moves of personnel from last duty station	S
Other - unit moves, PCS of < $100 (CONUS) or < $400 (overseas), AFR and ANG accession and separation, government agencies	P,L,N,Q,V,M,W,X,Y,Z

Table 1: Categories of PCS moves (Based on AFM 300-4, Vol. III, ADE PE-623 [13].)

figures supplied to the Office of VAMOSC by HQ AF/MPPB. There are separate average cost figures for each type-PCS/grade-type combination. A cost for each combination is needed to reflect differences in the cost of each type-PCS and in PCS compensation policies for officer and enlisted personnel. The matched average PCS cost figure is copied to the personnel record.

PCS costs are summarized along with personnel counts during MPC file processing. PCS costs are allocated to the MDS level using the same factors as are used to allocate numbers of personnel to the cost categories. Personnel are allocated using crew tables for aircrew, flying hour/possessed hour ratios for command staff and other unit personnel (FY82 only), manhour ratios for maintenance personnel, and a ratio of WSSC strength (CMD/GELOC/MDS) to base population for installation support personnel. PCS costs for airmen and officers are given separate visibility on the WSSC O&S cost report. In addition to the implementation of this PCS algorithm in FY82, the Office of VAMOSC used modified pay tables, which did not include the average PCS cost in the composite pay rate, to compute pay for all military personnel.

B. QUALITATIVE EVALUATION

Since PCS costs were included in pay and allowance figures in WSSC FY81 reporting, the separate visibility desired for these costs in the CAIG and USAF reporting formats did not exist. However, separate reporting of PCS costs for military personnel began in FY82 using the algorithm described above. This action allows WSSC to more fully comply with CAIG guidelines [1]. This algorithm represents a reasonable and valid method to develop and allocate PCS costs to the aircraft.

1. Avoidance of Double-Costing

WSSC avoided several double-costing pitfalls when implementing the PCS algorithm. In FY82, pay and allowances for all personnel were calculated using pay tables. Since the tables were modified to exclude an average PCS cost, there is no double-costing in these pay calculations. Additionally, pay and allowances are no longer extracted from H069R; therefore, the PCS costs included in these cost records will not be double-costed.

There is, however, an unusual use of codes in H069R records which impinges on the WSSC portrayal of PCS costs. According to AFM 300-4 [10], PEC 88731 is for permanent change of station costs and PEC 88732 is for transient personnel costs while on PCS. However, in examining the FY81 ABDS records for MAC and TAC, PEC 88731 was not used and PEC 88732 was only used for a total of 107 records between the two commands.

These commands surely experienced PCS moves whose costs should have been included under PEC 88731 in FY81. This suggests that PCS costs are not accounted for by H069R in an obvious manner. This also leaves open the possibility that PCS costs are hidden in H069R accounts other than the PCS costs included in H069R pay and allowance records, thus allowing for inadvertent double-costing by WSSC. The Office of VAMOSC should examine the Air Force procedures for reporting PCS costs to the accounting system to determine the impact on WSSC.

2. Tracking PCS Moves

The Office of VAMOSC is investigating the availability and relevance of a separate PCS file produced by the E300Z personnel system. This file tracks

the number of PCS moves by CMD/GELOC. It is hoped that this file will remedy the situation in which PCS moves initiated in the final quarter of the fiscal year and completed early in the next fiscal year are not costed in the year they are initiated. This is because the algorithm tracks only PCS arrivals, which may occur well after the move is initiated. However, funds are expended throughout the duration of the move.

Desmatics does not consider this to be a flaw in the WSSC collection of PCS costs. Since this situation will occur in every fiscal year, the costs picked up by the PCS algorithm from final quarter moves in the previous year should balance the costs of the final quarter moves initiated in the present year.

3. Civilian PCS Costs

CAIG defines PCS as "the cost of permanent change of station moves for primary program element, BOS, and medical personnel" [1]. This includes both military and civilian personnel. However, the WSSC PCS cost algorithm computes only military PCS costs. Civilian PCS costs are included in H069R (for example, an RC/CC of XX8101 and EEIC's of 395, 421, 46X). These records are almost exclusively coded with a PEC of XXX96. This combination of PEC and EEIC's places these records in the WSSC cost category of "base operations - other". This means that WSSC is collecting civilian PCS costs, but is not providing the visibility for them that is implied by CAIG guidelines.

Desmatics recommends removal of civilian PCS costs from the installation support category and inclusion in the PCS cost display, to more closely conform to CAIG guidelines. This may be accomplished in two ways. Since the civilian MPC file contains date-arrived-on-station and type-PCS data,

the PCS cost algorithm WSSC now uses could be used to compute civilian PCS costs by expanding the average PCS cost table to include average costs for civilians. The civilian PCS cost records mentioned above would need to be deleted to avoid double-costing. A second method would be to change the WSSC selection logic to exclude civilian PCS records from the BOS category and to add these costs to the total military PCS cost developed by the algorithm.

Either method can be considered valid. Both approaches will effectively allow for the visibility of civilian PCS cost. However, Desmatics recommends the first method in order to achieve a consistent development of PCS costs for all personnel by WSSC.

V. PERSONNEL ACQUISITION AND TRAINING

According to CAIG guidelines, personnel acquisition and training (A&T) is the recurring cost to acquire and train officer and enlisted personnel. Acquisition costs include recruiting and basic military training, Reserve Officer Training Corps (ROTC), Officer Training School (OTS), Air Force Academy, and the Airmen Education and Commissioning Program (AECP). Training costs consist of Undergraduate Pilot Training (UPT), Undergraduate Navigator Training (UNT), and nonaircrew officer and enlisted specialty (initial skills) training [15]. In the WSSC USAF reporting, personnel acquisition and training is called personnel replacement.

A. PROCESS DESCRIPTIONS

Acquisition and training costs were unavailable for FY81 and FY82 WSSC reporting, due to the lack of a suitable method to collect and portray them. The Office of VAMOSC has, however, proposed an algorithm to compute A&T costs. This algorithm, which is documented in August 1982 WSSC training conference notes [8], is the basis of the Desmatics evaluation.

1. Acquisition Costs

From the E300Z interface, records of personnel arrivals with type-PCS of "A" (accession) and "B" (training) are selected. These records contain information on the gaining command, base, FAC, PEC, and grade of the individual. The enlisted accession arrivals (EAA) are summarized by CMD/GELOC/FAC/PEC:

EAA = (# of "A" arrivals w/grade $\leq$ E2) + (# of "B" arrivals w/grade $\leq$ E2).

Officer accession arrivals (OAA) are summarized similarly by CMD/GELOC/FAC/PEC:

OAA = (# of "A" arrivals w/grade = 01) + (# of "B" arrivals w/grade = 01).

The acquisition costs by CMD/GELOC/FAC/PEC are then computed:

Enlisted costs = EAA x average enlisted acquisition cost

Officer costs = OAA x average officer acquisition cost.

The average acquisition costs are obtained from AFR 173-13 [16]. In order to allocate the costs to the MDS level, the Office of VAMOSC has proposed to match the PEC of the arrival records to the PEC of aircraft records in AVISURS. However, no formal description of this PEC-MDS allocation process has been developed.

2. Training Costs

Undergraduate Pilot Training (UPT) costs are collected by summarizing the number of type-PCS "D" (Initial rating training) pilot arrivals by CMD/GELOC/MDS. The MDS is determined by matching the AFSC of the arrival to those listed in AFR 173-13, Table 4-1 [16]. This table lists the AFSC's of required aircrew members for each MDS. The UPT costs are computed by multiplying the number of arrivals by the average UPT cost supplied by ATC. The costs are then allocated to the MDS indicated by the AFSC.

Nonpilot aircrew training costs include Undergraduate Navigator Training (UNT) for officers and training of enlisted personnel for positions such as inflight refueling specialist or aerial gunner. The UNT costs are developed by collecting type-PCS "D" arrivals with navigator AFSC's. These

AFSC's are related to MDS by using Table 4-1 in AFR 173-13 as mentioned above. The number of such arrivals is summed by CMD/GELOC/MDS and multiplied by the average UNT cost, giving officer nonpilot aircrew costs for an MDS.

Enlisted nonpilot aircrew costs are developed somewhat differently. The type-PCS "D" enlisted records with AFSC 11XXX are summed by CMD/GELOC/MDS/AFSC. The MDS is determined using AFSC as above. An average cost per graduate by AFSC is available in AFR 173-13, Table 3-2. This cost is multiplied by the number of enlisted arrivals in that AFSC. The cost for all AFSC's within the CMD/GELOC/MDS level are summed and allocated to that MDS directly.

Initial skills (Specialty) training provides officer and enlisted personnel with skills to perform specific jobs, leading toward the award of an AFSC or rating [5]. Initial skills training cost is found by selecting type-PCS "A" and "B" arrivals with grades of less than or equal to E2 or equal to O1 from MPC records. These arrivals are summarized by CMD/GELOC/FAC/PEC/GRADE/AFSC. Costs are developed:

Total Cost AFSC "Z" = (# arrivals AFSC "Z") x (avg. cost per grad. AFSC "Z").

An average cost per graduate by AFSC is available in AFR 173-13. The costs are then allocated to MDS using the PEC-MDS matching mentioned previously.

The individual types of allocated training costs are not given separate visibility. They are included within the heading of personnel acquisition and training in the CAIG report and personnel replacement in the USAF Detail report.

B. QUALITATIVE EVALUATION

The UPT and nonpilot aircrew portions of the Acquisition and Training algorithm represent a reasonable method of developing these costs and allocating them directly to an MDS. The validity of the remainder of the A&T cost algorithm (acquisition and initial skills training costs) depends in large part on the ability to map the program element code (PEC) of the MPC arrival records to the MDS's PEC.

An examination of personnel records from E300Z (MPC) and aircraft records from G033B (AVISURS) indicates that matches do occur between the PEC's. In a sample of FY81 data, the percentage of personnel at a base matching to at least one MDS at that base ranges from 29% to 90%. In Desmatics' opinion, personnel that match with more than one MDS may be allocated to the individual MDS's with a base-level personnel strength ratio. An example of such a ratio is:

$$\frac{\text{\# enlisted operations personnel CMD/GELOC/MDS}}{\text{\# enlisted operations personnel CMD/GELOC/all matching MDS's}} .$$

Similar ratios can be developed for officer operations, enlisted maintenance and officer maintenance personnel arrivals, as appropriate. This will permit the required separate visibility of officer and airmen costs.

Virtually all of the nonmatching personnel records have PEC's which are defined by WSSC as installation support. The acquisition and training costs of these people also need to be allocated to the MDS's at that base. Desmatics recommends applying the same strength ratios used to allocate installation support personnel to CMD/GELOC/MDS.

Using samples of FY81 MPC and AVISURS data for seven bases, Desmatics assessed a method in which the A&T costs of PEC matches are allocated di-

rectly to MDS and those of installation support personnel are allocated using strength ratios. The percentage of personnel in relevant commands allocable to an MDS is as follows:

BASE	% Allocable to MDS
Taegu	92.9
Tinker	91.4
Torrojon	94.3
Travis	98.7
Tyndall	93.8
Upper Heyford	96.7
Vance	96.2

These figures indicate that PEC matching can be effective in allocating A&T costs to the MDS level. This effectiveness can be enhanced by suitably allocating the remainder of the nonmatching PEC's. The first type are PEC's which contain generally small numbers of personnel, some of which are what Desmatics refers to as "dedicated transient maintenance" since these squadrons exist to satisfy the needs of frequent-visiting transient MDS's. To allocate the acquisition and training costs of the dedicated maintenance personnel, Desmatics recommends that these costs should be: (1) identified to the aircraft which the PEC indicates they support, (2) summed to the worldwide level for that MD or MDS, and (3) allocated to the CMD/GELOC level using aircraft inventory ratios.

For the other nonmatching PEC's, Desmatics recommends rolling up the acquisition and initial skills training costs for these individuals to the GELOC level and allocating to all MDS's at that GELOC using a ratio of each MDS O&M strength to the total GELOC O&M strength, similar to those used above. Since this algorithm uses the same PCS arrival data as the PCS algorithm, it would also be susceptible to the problem of failing to pick up

moves initiated late in the final quarter of the fiscal year and not reported until the next year. As mentioned in Section IV of this report, Desmatics does not consider this to be a significant problem for the algorithm as the costs carried over from one fiscal year to the next should balance out.

VI. ADVANCED FLYING TRAINING AND ADVANCED TRAINING COSTS

WSSC currently has no algorithm for collecting and portraying either advanced flying training or advanced training costs, as is desired in VAMOSC reporting. As a result, there is no basis for an evaluation by Desmatics of WSSC's treatment of these two cost categories. However, Desmatics has researched these areas in order to propose some means of capturing these costs so that the Office of VAMOSC may use this as a point of departure for developing a formal algorithm.

Desmatics' research effort included contacting HQ ATC/ACMQ for assistance in delineating these cost categories and in locating appropriate data. In addition, Desmatics reviewed Air Force documentation on formal education and training courses.

A. ADVANCED FLYING TRAINING

The AF Form 611, which is produced as part of the Formal Training Course Cost Report (RCS:HAF-ACM(AR)7108) [14], is recommended as a source of cost data for advanced flying training. These reports are prepared annually for the courses listed in AFM 50-5, Volume 2, "USAF Formal Schools Catalog" [12]. The flying training course descriptions in AFM 50-5 indicate for which MD or MDS the course is intended.

According to HQ ATC/ACMQ, the courses which should be considered as advanced flying training are those which, (a) are for pilots or nonpilot aircrew, and (b) have at least UPT, UNT, or some initial aircrew skills training as prerequisites. The course descriptions would have to be scrutinized to determine the courses which fit these conditions.

When the courses have been selected, they should be grouped as to which MD/AFSC or MDS/AFSC they pertain. This AFSC information may be found in AFR 173-13, Table 4-1, which is currently being used by WSSC in the allocation of aircrew costs [17].

The total course cost is found by multiplying the average cost-per-graduate figure by the number of course graduates. These costs include items such as pay, aviation POL, and below depot maintenance. This information is provided on the AF Form 611. However, the graduates are not identified by their command, only to the command which did the training. Thus, this total cost figure will contain the cost for training pilots and aircrew in nonrelevant commands such as ANG, AFR, AFCC, and AFLC. Therefore, the number of graduates must be adjusted to account for this fact. In addition, the costs must be allocated to the CMD/GELOC/MDS level. These two tasks can be accomplished by the following method:

$$\frac{\#\ \text{Personnel (CMD/GELOC/MDS/AFSC)}}{\#\ \text{Personnel (all CMD's/AFSC)}} \times [(\#\ \text{grads.}) \times (\text{avg. cost per grad.})]$$

The number of graduates in nonrelevant commands is accounted for by considering the number of personnel in all commands having the AFSC to which the course relates. This will entail including MPC data from both relevant and nonrelevant commands.

WSSC currently produces the information needed for the numerator of the ratio. For instance, the "Actual Aircrew and Crew Ratio Report" [7] displays the number of aircrew personnel at a CMD/GELOC/MDS/AFSC combination. The allocated training costs can be displayed on the WSSC reports as separate lines for officers and airmen, based on the AFSC of the personnel.

B. ADVANCED TRAINING

According to WSSC documentation, advanced training consists of formal follow-on and upgrade training, exclusive of on-the-job and advanced flying training [17]. This definition has enough leeway to allow for various interpretations. When implementing an advanced training algorithm, the Office of VAMOSC must establish a more precise definition. For the purposes of developing the basis for a possible algorithm, Desmatics considered only those courses listed in AFM 50-5, Volume 2, which may be identified from their description as being aircraft-related training, other than flying training. For the most part, this is maintenance training. A case can be made for including costs for indirectly related courses, such as computer programming. However, it is difficult to delimit this indirect category and justify its inclusion in WSSC.

As with advanced flying training, one source of cost data being recommended is the AF Form 611 [11]. Appropriate courses are selected by their descriptions in AFM 50-5, Volume 2. As before, these courses can be categorized as being related to: (a) MDS, (b) MD, or (c) aircraft in general. Those which are related to an MD or MDS may be allocated as is suggested for similarly categorized advanced flying training courses. Of course, for maintenance courses, the number of maintenance personnel would be substituted in the ratios in place of the number of aircrew related to an MDS.

General courses such as survival training may be allocated to the CMD/GELOC/MDS level using ratios of the number of aircrew or maintenance personnel associated with the MDS at that CMD/GELOC to the number of these people worldwide on all MDS's. Separate ratios must be developed to maintain separate visibility for officer and airmen costs. The courses are already divided

in this way in AFM 50-5, Volume 2. Once again, the number of graduates reported for the various courses should be adjusted to account for nonrelevant command aircrew taking the course. This may be accomplished in the same way as is suggested for advanced flying training costs.

An important component of advanced training is the training done by the ATC field training detachments (FTD) as tenant units to the various relevant commands. These units train maintenance and aircrew personnel on specific MD's or MDS's [11]. Unfortunately, the courses conducted by these units are exempted from reporting their costs on the AF Form 611 by AFR 173-7 [14]. In order to develop these costs a different approach must be used.

The costs for ATC FTD's are recorded in RC/CC 9X37XX in the H069R accounting system. These costs are currently being included in WSSC on the basis of CC 37XX [16]. As the Office of VAMOSC has pointed out, FTD's in many cases train for all bases in-theatre using the same MDS. Allocating training costs of all bases to the FTD's home base may require additional considerations.

To produce the required visibility of officer and airmen costs, the FTD costs can be allocated on the basis of personnel strengths associated with the aircraft. Since the FTD courses almost exclusively deal with maintenance techniques, maintenance personnel counts could be the basis of the strength ratios.

C. ADDITIONAL COMMENTS

Although Desmatics suggests using the same source of cost data (i.e., AF Form 611) as does Hunsaker, et. al. [5], the means of allocation the two use are fundamentally different. Hunsaker recommends allocation based on numbers of aircraft. This does not allow for differences in manpower requirements inherent with different types of aircraft. Desmatics feels that the number of personnel associated with an MDS is a better cost driver for these costs since it is the personnel that must be trained to work with the weapon system.

Many of the costs being reported by the Form 611 and RC/CC 9X37XX are already being included in WSSC reporting, but without separate visibility. Examples of these costs are pay and material expenses. They are currently included in the various operating and support categories. Accurately identifying and removing these costs using only present data systems would be difficult. Even if these costs could be identified, the removal of the training portion of the other O&S costs would result in a misleading representation of an MDS's O&S costs. Therefore, double-costing in this area is certain unless there is a change in the reporting format.

To avoid double-costing in the WSSC reporting when using the proposed advanced training cost data, the manner of presenting these costs on the USAF Detail Report should be slightly altered. The USAF Detail Report presently portrays the two advanced training costs as discrete categories which would be added as additional operating and support costs for an MDS. However, as stated above, these costs represent a subset of the other O&S costs already being portrayed. The report should be changed so it is evident that these training costs are not an additional O&S cost. One way to accomplish this

is to include a separate training cost report, much like the WSSC "Actual Aircrew Report" [7], and remove these cost categories from the USAF Detail Report. A second way would be to exclude the advanced flying training and advanced training lines from the "Total" column on the report.

In either case, to be consistent in the reporting of advanced training, FTD costs should remain as is in WSSC processing. They should also be reported along with the other categories included in the recommended separate reporting of advanced training costs. A caveat explaining that these costs represent a specific portion of the other cost categories may need to be included to avoid misinterpretation.

Desmatics has put forth these suggestions to assist the Office of VAMOSC in its development of an algorithm to provide visibility for advanced flying training and advanced training costs. As previously mentioned, they should be considered only as a preliminary point of departure and not as a definitive solution to the problem of defining, developing, and portraying these cost areas. In Desmatics' opinion, further detailed research by the Office of VAMOSC into the specifics of these important cost categories is merited.

VII. CONCLUSIONS, RECOMMENDATIONS, AND OFFICE OF VAMOSC COMMENTS

This volume has presented an evaluation of WSSC cost allocation algorithms for three areas included in indirect personnel support costs: medical, permanent change of station, and personnel acquisition and training. In addition, it has put forth suggestions to aid in the development of algorithms for advanced training and advanced flying training.

A. SUMMARY

Although the current algorithms are either new or enhanced versions with little accompanying documentation, they do, for the most part, appear to provide reasonable means for collecting and portraying these costs. However, Desmatics has made a number of recommendations that should result in an improved WSSC system. The Office of VAMOSC has not yet developed formal algorithms for collection and allocation of two types of personnel related costs: advanced training and advanced flying training. Desmatics has, therefore, limited its discussion of these topics to suggesting means of capturing these costs for development of the required algorithms.

B. RECOMMENDATIONS AND REPLIES

This section lists Desmatics' conclusions and recommendations with respect to the WSSC algorithms for the personnel-related costs addressed in this report. The responses or comments provided by the Office of VAMOSC are also included.

1. Medical Cost Factor Components

Conclusion: In the computation of the medical cost factor, some relevant costs are omitted from consideration. This results in an understatement of the actual cost of medical care.

Recommendation: To obtain more realistic figures for the total cost of medical care allocable to weapon systems, the Office of VAMOSC should ensure that WSSC includes the following costs: (1) Dental Care, and (2) selected subaccounts in Special Programs.

Office of VAMOSC Comments: "Concur. The Office of VAMOSC will request this information from the Office of the Air Force Surgeon General. The proposed implementation is for FY84 data reports."

2. Medical Costs - Dependents of Active Duty Personnel

Conclusion: Medical care costs incurred by dependents of active duty personnel are part of the real cost of health care associated with deployment of a mission. These costs should therefore be included for allocation to weapon systems.

Recommendation: The Office of VAMOSC should request that the Office of the Surgeon General revise the calculation of the medical cost factor to incorporate medical costs attributable to dependents of active duty personnel.

Office of VAMOSC Comments: "Concur. The Office of VAMOSC will request this information from the Office of the Air Force Surgeon General. The proposed implementation is for FY84 data reports."

3. Allocation of Medical Costs

Conclusion: The allocation procedure implemented in FY82 which incorporates security personnel (previously excluded) and allocates based on personnel strength ratios rather than ratios developed from flying hour and possessed hour data is a significant improvement over the FY81 algorithm.

Recommendation: The Office of VAMOSC should continue to use this improved allocation procedure.

Office of VAMOSC Comments: "Concur."

4. Worldwide Medical Cost Factor

Conclusion: Although base-level factors could be developed, the use of a worldwide medical cost factor is a reasonable method for allocating health care costs to weapon systems.

Recommendation: The Office of VAMOSC should continue to use the worldwide medical cost factor.

Office of VAMOSC Comments: "Concur."

5. PCS Cost Reporting Procedures

Conclusion: The nonuse of program element codes intended for PCS costs in H069R suggests that these costs may be recorded in an unrecognizable manner. This leaves open the possibility of inadvertent double-costing of PCS by WSSC.

Recommendation: The Office of VAMOSC should examine Air Force procedures for reporting PCS costs to H069R to ensure that WSSC will not double-cost in this category.

Office of VAMOSC Comments: "Concur. We have completed a review of the H069R system and it does not include PCS costs."

6. Civilian PCS Costs

Conclusion: The PCS costs of civilian personnel should be displayed along with military personnel costs, in order to more closely conform with CAIG guidelines.

Recommendation: The Office of VAMOSC should develop civilian PCS costs using the PCS cost algorithm in order to achieve consistent computation of PCS costs for all personnel. (Civilian PCS cost records from H069R would need to be deleted to avoid double-costing.)

Office of VAMOSC Comments: "Nonconcur. There are insufficient civilian PCS moves for the AFAFC to develop average PCS costs for civilians. There is no accurate way to allocate actual costs because of the lack of visibility over duty posting of civilians."

7. Tracking PCS Moves

Conclusion: The overflow of PCS moves from the final quarter of one fiscal year to the first quarter of the next year does not invalidate the PCS cost algorithm. This situation should remain relatively homogeneous from year to year and hence should balance out.

Recommendation: The Office of VAMOSC need not switch to a PCS file which tracks the initiation of PCS moves, especially if it would require significant programming revisions.

Office of VAMOSC Comments: "Concur."

8. Personnel Acquisition and Training (A&T) Costs

Conclusion: The success of this allocation algorithm depends on the ability to match the PEC of the personnel to the aircraft MDS at a base. An analysis of a sample of MPC and AVISURS data by Desmatics indicates that this method is feasible in matching a large portion of the records. However, nonmatches do occur and require some judgement as to their handling.

Recommendation: The Office of VAMOSC should allocate the A&T costs of "dedicated maintenance personnel" to the CMD/GELOC level in the following manner: (1) identify the MD or MDS which the personnel record PEC indicates they support, (2) accumulate their training costs to the worldwide level for that MD or MDS, and (3) allocate the costs to the CMD/GELOC/MDS level using aircraft inventory ratios. The remaining nonmatches can be accumulated and allocated to the aircraft at that GELOC using personnel strength ratios.

Office of VAMOSC Comments: "Concur. This preliminary review is a helpful starting point for development. It is projected that this capability will be implemented for FY86 data reports."

9. Advanced Training and Advanced Flying Training Data Sources

Conclusion: The AF Form 611 portion of the Formal Training Cost Report (RCS:HAF-ACM(AR)7108) and AFM 50-5 provide valuable information on advanced training courses and their costs.

Recommendation: The Office of VAMOSC should consider using these two data sources in developing an algorithm to satisfy reporting requirements for advanced training and advanced flying training.

Office of VAMOSC Comments: "Concur. During development of this capability, these data sources will be considered."

10. Inclusion of ATC Field Training Detachments

Conclusion: The costs for an important element of advanced training, ATC Field Training Detachments (FTD), are not included in the training cost report. These costs must be added to have a more complete algorithm.

Recommendation: The Office of VAMOSC should consider using H069R cost records coded with RC/CC 9X37XX to develop these FTD costs. Information to relate these costs to MDS is available in AFM 50-5, Volume 1.

Office of VAMOSC Comments: "Concur. The difficulty of allocating costs of FTD training has not been fully overcome by this recommendation but these considerations will be used in defining advanced training costs."

11. Advanced Flying Training and Advanced Training Cost Allocations

Conclusion: The number of personnel associated with an MDS represents an appropriate cost driver for the allocation of these training costs.

Recommendation: Any Advanced Flying Training/Advanced Training algorithm developed by the Office of VAMOSC should allocate based on personnel strengths rather than numbers of aircraft. In addition advanced training should not be allocated to MDS's in the same ratio as advanced flying training.

Office of VAMOSC Comments: "Concur."

12. Avoiding Double-Costing of the Advanced Training Categories

Conclusion: The costs reported by the AF Form 611 and RC/CC 9X37XX are presently being reported by WSSC, but without visibility as advanced training or advanced flying training costs. Therefore, double-costing will be present when using these data sources. Concomitant with the use of any algorithm using these data sources would be a necessary change in the structure of the USAF Detail Report to exclude the two advanced training detail lines from the "Total" column to avoid double-costing.

Recommendation: The Office of VAMOSC should decide whether to modify the present format of the report or to report these costs separately to avoid this overstatement of costs.

Office of VAMOSC Comments: "Concur. The Office of VAMOSC intends to report these costs as a discrete item but not to sum that number into the total O&S cost element. This will preclude double-costing."

VIII. REFERENCES

1. Cost Analysis Improvement Group (CAIG), "Aircraft Operating and Support Cost Development Guide," Office of the Secretary of Defense, 1980.

2. K. L. Evans, R. L. Gardner, and D. E. Smith, "An Evaluation of the WSSC Cost Algorithms II: Installation Support," Technical Report No. 115-3, Desmatics, Inc., 1983.

3. R. L. Gardner, K. L. Evans, and D. E. Smith, "An Evaluation of the WSSC Cost Allocation Algorithms III: Unit Operations," Technical Report No. 115-4, 1983.

4. R. L. Gardner, D. E. Smith, and K. L. Evans, "An Evaluation of the WSSC Cost Allocation Algorithms I: Overview," Technical REport No. 115-2, Desmatics, Inc., 1983.

5. H. D. Hunsaker, N. W. Foster, and M. L. Hoza, "Acquisition and Training Cost Portrayal by VAMOSC II," AFLC Technical Report No. 80-030A, 1981.

6. T. J. Little and J.P. Taylor, "The Uniform Chart of Accounts and Its Use in Management Control," Thesis, Naval Postgraduate School, Monterey, CA, 1982.

7. Office of VAMOSC, "Actual Aircrew and Crew Ratio Report," Department of the Air Force, 1982.

8. Office of VAMOSC, Handouts, WSSC Training Conference, 1982.

9. Office of VAMOSC, "Subsystem Specification of the Preprocessor (VAMOH)," Department of the Air Force, 1981.

10. Office of VAMOSC, "System/Subsystem Specification of the Weapon System Support Costs Subsystem (WSSC)," Department of the Air Force, 1981.

11. U. S. Air Force, Air Force Manual 50-5, Volume 1, "USAF Formal Schools Catalog," 1981.

12. U. S. Air Force, Air Force Manual 50-5, Volume 2, "USAF Formal Schools Catalog (course announcements)," 1982.

13. U. S. Air Force, Air Force Manual 300-4, Volume III, ADE PE-623, "Permanent Change of Station (PCS) Travel Cost Identifier," 1982.

14. U. S. Air Force, Air Force Manual 300-4, Volume III, ADE PR-570, "Program Element," 1982.

15. U. S. Air Force, Air Force Regulation 173-7, "Formal Training Course Cost Report, (RCS:HAF-ACM(A)7108)," 1982.

16. U. S. Air Force, Air Force Regulation 173-13, "USAF Cost and Planning Factors," 1982.

17. U. S. Air Force, Air Force Regulation 400-31, Vol. II, "Weapon System Support Costs (WSSC)," 1982.